# Frederik De Ceuster

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## EMPLOYMENT

- Postdoctoral researcher    2021 - 2022
  **Institute of Astronomy**, **KU Leuven** (Belgium)

- Web, Social media, and Training manager (part time: 20%)    2017 - 2021
  **DiRAC** (Distributed Research utilising Advanced Computing)

## EDUCATION

- Doctor of Philosophy (**PhD**; Computational Astrophysics)    2017 - 2021
  **University College London**, United Kingdom
  Thesis: Simulating 3D Radiation Transport,
    a modern approach to discretisation
    and an exploration of probabilistic methods
  Supervisors: Dr. Jeremy Yates, Prof. Dr. Leen Decin,
    Prof. Dr. Peter Boyle, and Prof. Dr. James Hetherington

- Master of Science (**MSc**; Theoretical Physics)    2014 - 2016
  **KU Leuven**, Belgium (Magna Cum Laude)
  Thesis: Holographic explorations of spacetime singularities
  Supervisors: Dr. Adam Bzowski, and Prof. Dr. Thomas Hertog

- Bachelor of Science (**BSc**; Major Physics, Minor Mathematics)    2011 - 2014
  **KU Leuven**, Belgium (Magna Cum Laude)

## INTERNSHIPS

- February 2018, 6-month internship with **Intel** at the University of Edinburgh, *Parallelisation and scaling analysis of the transport solver Magritte*, supervisor: Prof. Dr. Peter Boyle.
- October 2019, 6-month internship with **Intel** (remotely), *Implementation and analysis of hardware acceleration in the transport solver Magritte*, supervisor: Prof. Dr. Peter Boyle.

## SELECTED PUBLICATIONS

(A complete publication list can be found here.)

- F. De Ceuster, et al., *3D Line Radiative Transfer & Synthetic Observations with Magritte*, Journal of Open Source Software, Vol. 7, Num. 71, pp. 3905, 2022.
- F. De Ceuster, et al., *Magritte, a modern software library for 3D radiative transfer: II adaptive ray-tracing mesh construction and reduction*, Monthly Notices of the Royal Astronomical Society, Vol. 499, Issue 4, pp. 5194-5204, 2020, arXiv:2011.14998.
- L. Decin, et al., *(Sub)stellar companions shape the winds of evolved stars*, Science, Vol. 369, Issue 6510, pp. 1497-1500, 2020, arXiv:2009.11694.
- F. De Ceuster, et al., *Magritte, a modern software library for 3D radiative transfer: I Non-LTE atomic and molecular line modelling*, Monthly Notices of the Royal Astronomical Society, Vol. 492, Issue 2, pp. 1812-1826, 2020, arXiv:1912.08445.

# SOFTWARE PROJECTS

(All projects can be found on github.com/FredDeCeuster)

- **Magritte**: an open-source software library for simulating 3D radiation transport & synthetic observations, github.com/Magritte-code/Magritte, see also magritte.readthedocs.io.
- **Paracabs**: parallelisation and acceleration abstractions for performance scaling and portability, github.com/Magritte-code/Paracabs.

# GRANTS

- KU Leuven, Belgium, 1-year **Post Doctoral Mandate** (2021-2022).
- Engineering & Physical Sciences Research Council (EPSRC, UK) industrial Cooperative Awards in Science & Technology (iCASE), a 4-year **PhD project** at University College London, Project Reference: 1878976.

# TEACHING

- **Lecturer** for *Physics I: Mechanics*, BSc Physics & Mathematics at KU Leuven, Fall term 2021, substituting for Prof. Dr. Leen Decin.
- **Teaching assistant** for *Physics I: Mechanics*, BSc Physics & Mathematics at KU Leuven, Fall term 2016, 2018, 2019, 2020.
- **Teaching assistant** for *Physics II: Electromagnetism*, BSc Physics & Mathematics at KU Leuven, Spring term 2015, 2016.

# SUPERVISION

- Shiqi Su (**PhD**, **Astronomy & Astrophysics**), topic: *Artificial neural networks for emulating radiative transfer simulations*, academic years 2021-2025, at University of Leicester.
- Thomas Ceulemans (**PhD**, **Astronomy & Astrophysics**; **FWO fellow**), topic: Computational aspects of radiative transfer, academic years 2021-2025, at KU Leuven.
- Annika Lauwerys (**High school final project**), topic: *Astronomical image deprojection using the Doppler shifts of spectral lines*, academic year 2021-2022, ZAVO Zaventem.
- Arnout Coenegrachts (**MSc thesis**, **Astronomy & Astrophysics**) topic: *Modelling the 3D distribution of NaCl around the AGB star IK Tauri*, academic year 2021-2022, at KU Leuven.
- Mats Esseldeurs (**MSc thesis**, **Astronomy & Astrophysics**) topic: *Implementing a ray-tracing 3D radiative transfer solver in the smoothed-particle hydrodynamics code PHANTOM*, academic year 2021-2022, at KU Leuven.
- Astha (**Research project**, **Physics**) topic: *Probabilistic numerics for solving linear partial differential equations*, spring semester 2022, at KU Leuven.
- Anirudh Sharma (**Research project**, **Physics**) topic: *Operator-adapted wavelets for optimal function approximation*, spring semester 2022, at KU Leuven.
- Atulit Srivastava (**MSc thesis**, **Astronomy & Astrophysics**) topic: *Machine Learning solutions to accelerate Radiative Transfer computations*, academic year 2020-2021, at KU Leuven.
- Thomas Ceulemans (**MSc thesis**, **Mathematics**), topic: *Multigrid solutions for Radiative Transfer*, academic year 2020-2021, at KU Leuven.
- Shiqi Su (**MSc thesis**, **Mathematics**), topic: *Artificial neural networks for uncertainty quantification*, academic year 2020-2021, at University College London.

# TALKS

- **Seminar** at the Department of Physics and Astronomy, Ghent University (March 24, 2022): *Approximate Radiative Transfer*;
- IAU Symposium 366: The Origin of Outflows in Evolved Stars (November 1, 2021; online); **invited training session**: *3D Radiative Transfer & Synthetic Observations with Magritte*;
- DELVE: The death-throes of evolved stars, a virtual encounter (April 12, 2021; online); **contributed talk**: Beyond the Treachery of Images: 3D Radiative Transfer with Magritte;
- **Seminar** at the Institute of Astronomy, KU Leuven (February 26, 2021; online), together with Silke Maes and Jolien Malfait: Hydro/radiative modelling of AGB wind-companion interactions;
- **Seminar** at the Institute of Astronomy, KU Leuven (October 10, 2019): Magritte, a modern software library for 3D radiative transfer.

# REFEREES

- **Prof. Dr. Leen Decin** (Postdoc supervisor)
  Institute for Astronomy,
  KU Leuven
  Email: leen.decin@kuleuven.be

- **Revd. Dr. Jeremy Yates** (PhD supervisor)
  Department of Computer Science & UCL Centre for Space Exo-chemistry Data,
  University College London
  Email: j.a.yates@ucl.ac.uk

- **Dr. Clare Jenner** (supervisor at DiRAC)
  Deputy director at DiRAC, Project Scientist at University College London
  DiRAC, University College London
  Email: c.jener@ucl.ac.uk